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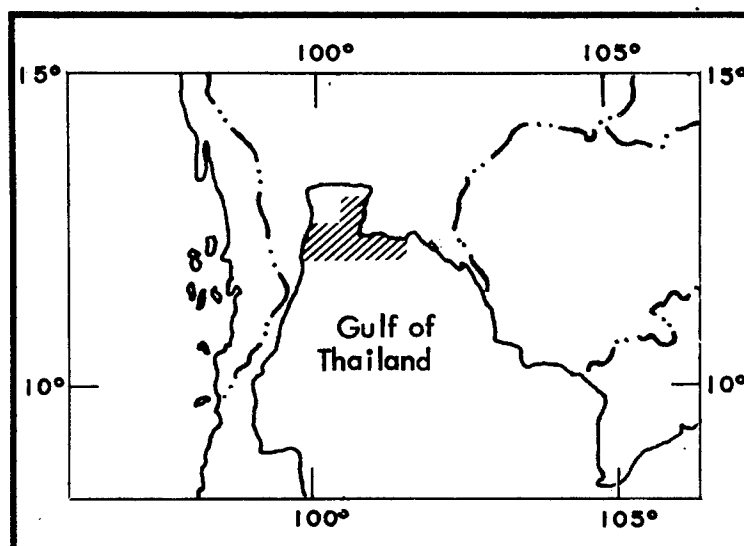
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INFORMAL REPORT

ENVIRONMENTAL DATA REPORT GULF OF THAILAND DECEMBER 1967 TO FEBRUARY 1968



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AUGUST 1969

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INFORMAL REPORT

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ABSTRACT

The U.S. Naval Oceanographic Office and the Royal Thai Navy conducted a joint environmental survey in the Gulf of Thailand from 20 December 1967 to 21 February 1968. Operations included serial-depth temperature and salinity measurements at 57 station locations and current meter observations at 47 of the stations.

The area surveyed in the Gulf of Thailand was found to be nearly isothermal and isohaline throughout the water column, which attests to a well-developed mixing environment. The tidal currents in the gulf are thought to be responsible for the homogenous nature of the water. Characteristic of the region surveyed was the variance in current direction with depth for any one station location and the change in current vectors over short durations. Measured current speeds ranged to a maximum of 0.8 knot.

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Nearshore Surveys Division
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This report has been reviewed and is approved for release as an UNCLASSIFIED Informal Report.



L. B. BERTHOLF
Director, Nearshore Surveys Division

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I. INTRODUCTION

An environmental survey was conducted in the Gulf of Thailand as a joint operation of the U.S. Naval Oceanographic Office (NAVOCEANO) and the Royal Thai Navy aboard HTMS BANGRACHAN (MMC 1) from 20 December 1967 to 21 February 1968. Operations were performed in the inner gulf and in the inshore area southeast of Sattahip (Operation Numbers 928026 and 928029). Figure 1 is a locator chart of the survey area.

From 1959 to 1961, a comprehensive survey in the Gulf of Thailand was the Naga Expedition (Wyrcki, 1961). NAVOCEANO surveys aboard USS FIRM (MSO 444) and USS SERRANO (AGS 24) in 1959 and 1961, respectively, supplied further background data. Personal conversation with Royal Thai Navy Hydrographic Office personnel provided valuable information, especially on the oceanographic vagaries that may be encountered within the gulf.

II. OBJECTIVES OF THE SURVEY

The objectives of NAVOCEANO operations aboard BANGRACHAN were to obtain environmental oceanographic data in the inshore areas of the Gulf of Thailand. The data required were current measurements and serial-depth temperatures and salinities.

III. NARRATIVE OF THE SURVEY

Royal Thai Navy (RTN) personnel and one NAVOCEANO oceanographer collected the environmental data from BANGRACHAN. A total of 57 stations was occupied. At each station, a Nansen cast and a bathythermograph (BT) lowering were made, and at 47 of the stations, current measurements were obtained. Figure 2 shows the station locations with current vectors indicated for the stations. Table I presents a station data summary.

IV. METHODS OF COLLECTION AND ANALYSIS

A. Temperature.

A shallow water mechanical BT was lowered at each station location to ascertain the existing temperature structure. The BT traces showed the shallow gulf areas to be nearly isothermal throughout the water column. Because of the isothermal condition, three or four Nansen bottles, each with three protected reversing thermometers, were evenly spaced throughout the water column. The temperatures from the three thermometers were averaged if the values were within 0.05°C . When temperatures differed more than 0.05°C , the values from the more reliable thermometers, based on past performances, were accepted. Thermometer

Wyrcki, K., 1961. Physical Oceanography of Southeast Asian Waters.
NAGA Report. Vol. 2.

performance in the field was checked by rotating individual thermometers from one Nansen bottle to another. A correction factor for errant thermometers was then derived by statistical analysis from the different thermometer pairings. The temperatures from reversing thermometers, after applying standard and individual corrections, are considered accurate to $\pm 0.02^{\circ}\text{C}$.

B. Salinity.

Water samples were drawn from the Nansen bottles and forwarded to NAVOCEANO for salinity analyses. Salinities were determined with an Industrial Instruments RS-7A inductive salinometer. Results are considered accurate to ± 0.01 o/oo.

C. Conductivity.

Conductivity values were hand computed from Nansen cast temperature and salinity data by the method described in NAVOCEANO Special Publication No. 11, "Tables for the Rapid Computation of Density and Electrical Conductivity of Sea Water."

D. Current Measurements.

A Roberts current meter was used to obtain in situ current measurements. BANGRACHAN was anchored fore and aft, and the meter was suspended from the stern. Readings generally were obtained 3 meters below the surface, at middepth, and 2 meters from the bottom. Interference from the ship's hull precluded any accurate current measurement less than 3 meters below the surface. An EA Recorder was used to give continuous readings. Current velocities were recorded for 4 to 6 minutes or, when low current speeds were evident, until a record of sufficient length was attained to allow a recognizable trend in current vectors.

When current speeds were less than 0.2 knot, the recordings of current direction usually deteriorated. In the presentation of this report, current speeds less than 0.2 knot were not used but are listed on the oceanographic summary sheets in the Appendix as "<2 knot" to indicate the presence of some current.

E. Meteorological Observations.

Meteorological observations were recorded by the oceanographer utilizing hand held equipment and by visual observations. Recorded information consisted of wind vectors, humidity, weather, cloud, and sea and swell observations.

F. Tidal Data.

Tidal values are predicted values from USC&GS tide tables for

Sattahip and Bangkok, Thailand. Cotidal charts were used to approximate tidal ranges and times for the western coast of the survey area.

V. DISPOSITION OF DATA

The current measurement data are on file at NAVOCEANO, and Nansen cast data and BT slides will be on file at the National Oceanographic Data Center. Individual oceanographic summary sheets are presented in the Appendix.

VI. PRELIMINARY ANALYSIS

A. Temperature.

All 57 stations were occupied during the daylight hours from approximately 0800 to 1600 hours (local). Positive temperature gradients, resulting from back radiation during the night, were a common occurrence until late morning when the gradient assumed either an isothermal or a negative profile. The temperature range throughout the water column was 26.50° to 27.73°C. At any one station, the temperature difference from surface to bottom did not exceed 0.54°C, and at 70 percent of the stations, the difference was within 0.30°C. Sea surface temperatures off the western part of the inner gulf averaged 0.25°C higher than surface temperatures off the eastern part and 0.60°C higher than in the area southeast of Sattahip. The nearly isothermal structure observed within the Gulf of Thailand attests to a well-developed mixing environment.

B. Salinity.

The salinity values throughout the survey area ranged from 31.70 to 32.45 o/oo. At any one station, the maximum difference from surface to bottom was 0.10 o/oo, and for 81 percent of the stations, the difference was only 0.03 o/oo. This display of vertical homogeneity and relatively little horizontal variation in salinity values also attests to a region of well-developed mixing.

Salinities in the area southeast of Sattahip were 0.10 to 0.14 o/oo higher than those in the inner gulf. A higher salinity can often be expected in areas outside the inner gulf because of less stream discharge.

C. Current Measurements.

The circulation pattern in the gulf proper is most dependent on the monsoon season. A small, permanent counterclockwise gyre occurs within the inner gulf (from personal conversation with RTN personnel). Subsequently, the gulf, and especially the region where the inner gulf and the gulf proper adjoin (approximately 12°40.0"N), is an area of complex water movement. During the survey period, circulation

within the inner gulf appeared to be dominated by the tidal currents which are thought to be responsible for the homogenous nature of the oceanographic environment.

Measured current speeds ranged to a maximum of 0.8 knot. The higher speeds occurred in the inner gulf during the ebb tide, and the flow was predominantly to the south. Characteristic of the region surveyed was the variance in current direction with depth for any one station and the change in current vectors over short durations. Attendant to these characteristics was the fluctuations of current, for a given depth, between two distinct directions. Station 94 exhibited some of the above characteristics; i.e., at the surface, the current set was 290° ; at middepth, the set was either 270° or 070° ; and near bottom, the set was 070° .

Data from two 24-hour current stations from the 1961 SERRANO cruise are shown in a time-depth presentation in Figure 3. The two station locations are plotted in Figure 2. The area surrounding station 2 was surveyed by NAVOCEANO in three different years: March 1959, March 1961, and February 1968. Current flow in this area is strongly affected by the coastal topography and the tides and is predominantly of the reversing type with strong horizontal shear currents. Data from station 1A, which is located in the inner gulf, depict the variation in current direction with depth for any one time frame.

D. Meteorological Observations and Tidal Data.

The period of the survey was during the inter-monsoon season, and the winds displayed such random circulation patterns that their effect on the measured oceanographic parameters was masked by tidal influence.

Tides were chiefly diurnal or semidiurnal with large inequalities between the ranges of successive highs or lows. The maximum predicted tidal range at Sattahip on the eastern coast of the inner gulf was 9 feet 8 inches. The tidal range was slightly higher on the western coast.

VII. FUTURE WORK IN THE REGION

The Royal Thai Navy Hydrographic Office has an ambitious oceanographic program outlined for the waters contiguous to Thailand. The program will provide for a year-round study of Thai waters and will include the region surveyed by NAVOCEANO.

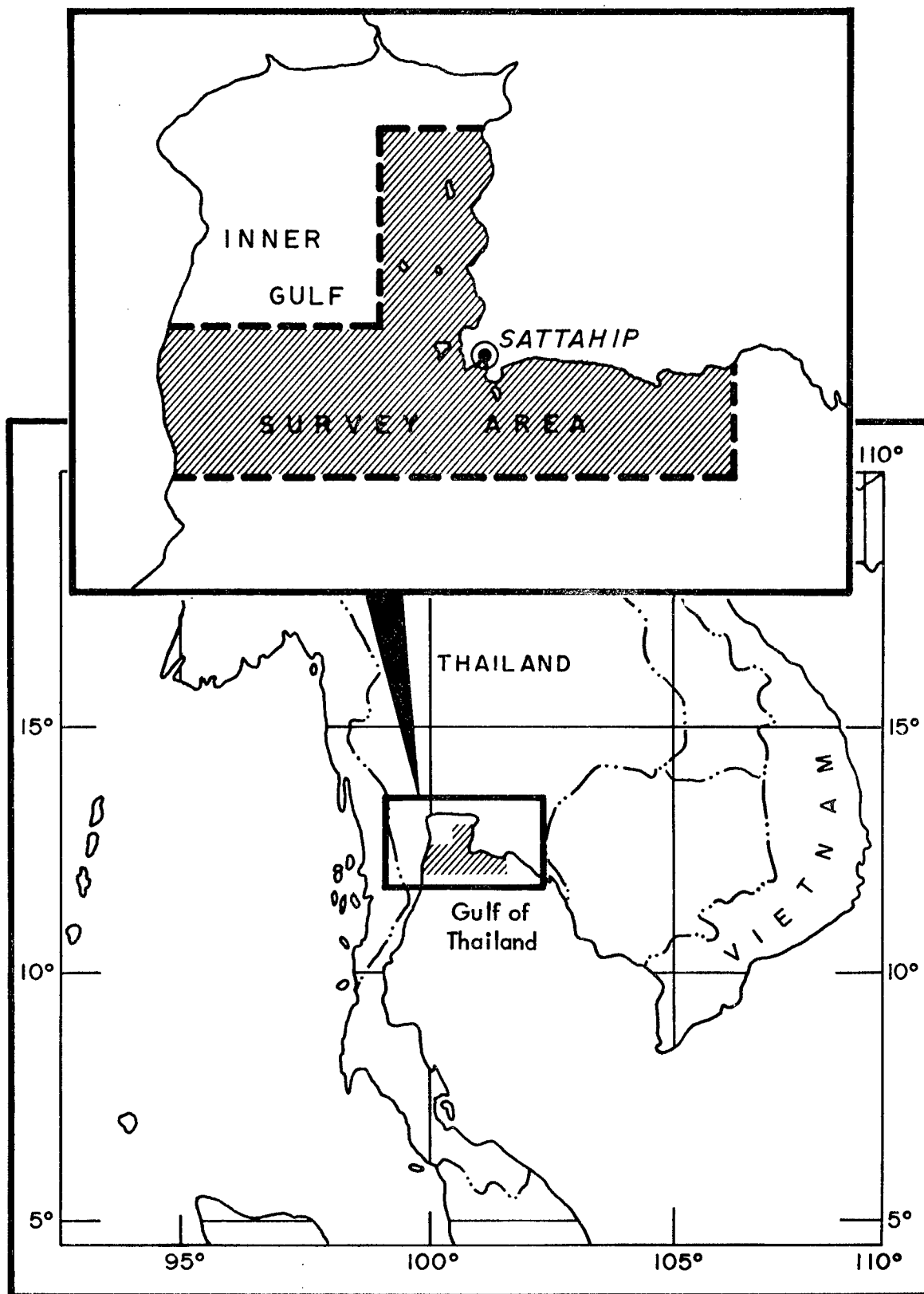
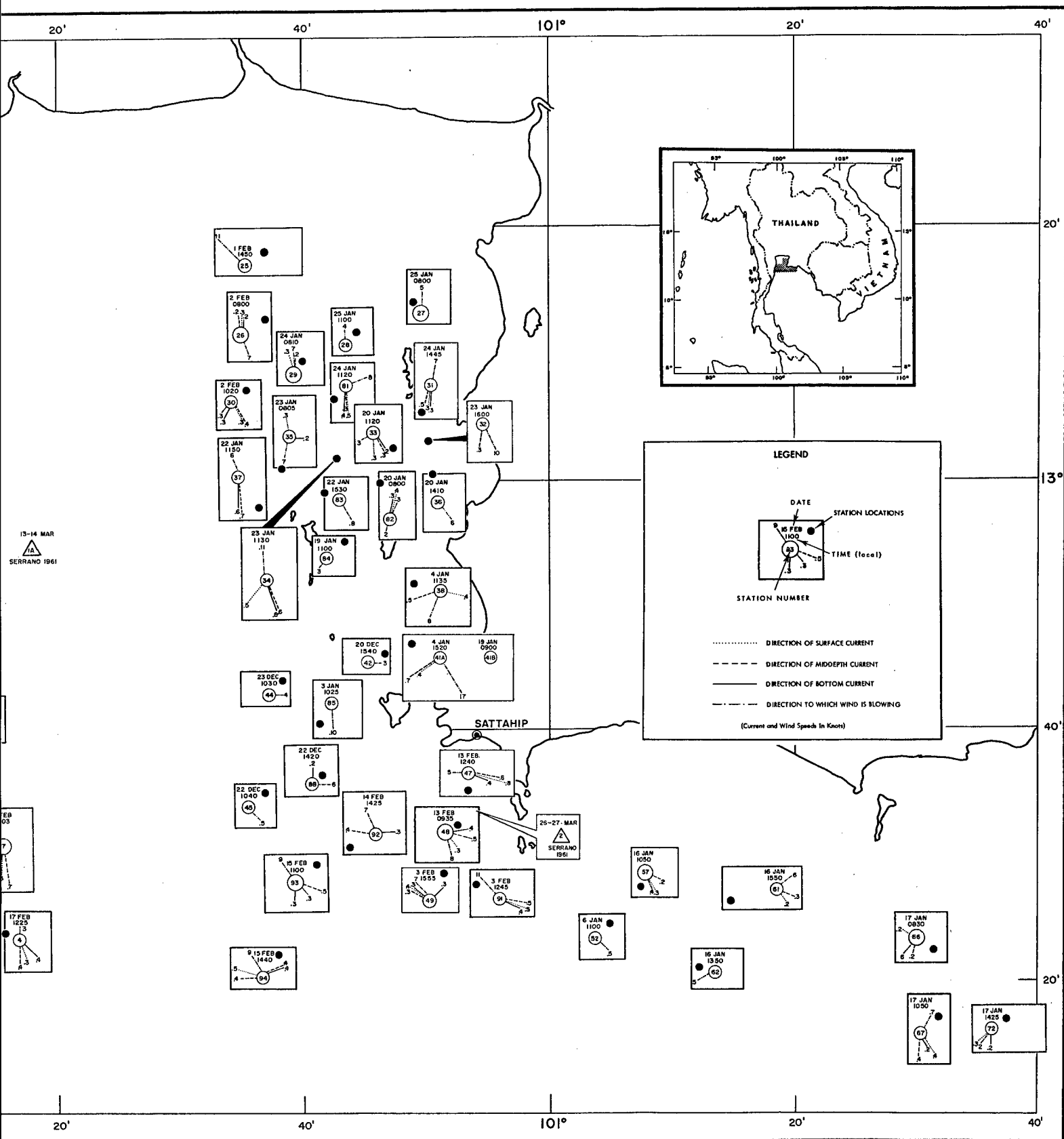


FIGURE 1. Locator Chart of the Survey Area.



locations. The observed current vectors at surface, middepth, and bottom are indicated.

2

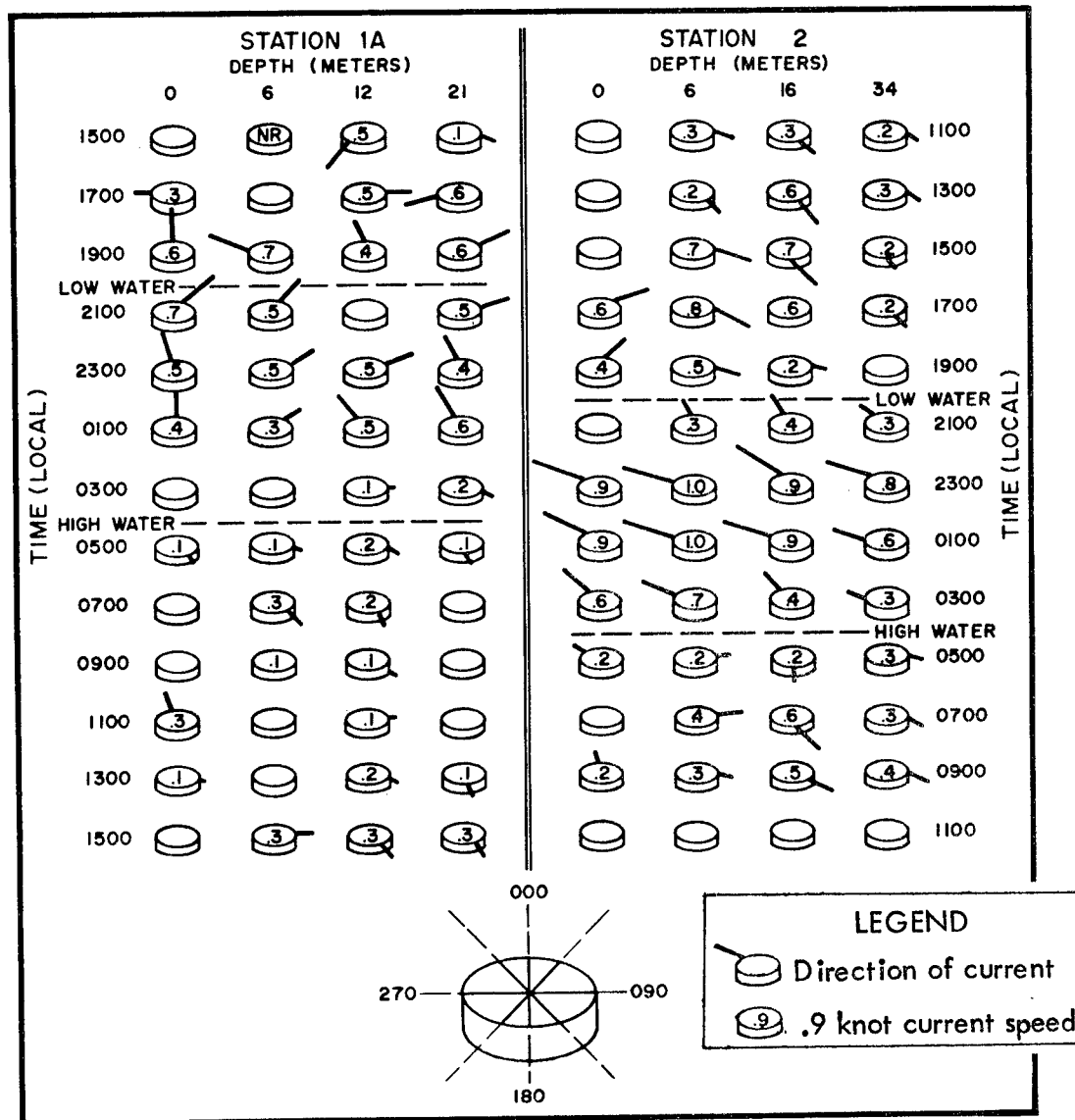


FIGURE 3. Current Data from Two 24-Hour Stations - 1961 SERRANO Cruise.

TABLE I. STATION DATA SUMMARY

| STATION NUMBER | SONIC DEPTH | STATION DEPTH | NANSEN CAST | CURRENT VELOCITY | BT |
|-------------------|----------------|------------------|----------------|---------------------|----|
| 1 | 15 | 13 | ✓ | ✓ | ✓ |
| 2 | 19 | 17 | ✓ | ✓ | ✓ |
| 3 | 26 | 24 | ✓ | ✓ | ✓ |
| 4 | 32 | 30 | ✓ | ✓ | ✓ |
| 5 | 15 | 13 | ✓ | ✓ | ✓ |
| 6 | 21 | 19 | ✓ | ✓ | ✓ |
| 7 | 20 | 26 | ✓ | ✓ | ✓ |
| 9 | 15 | 13 | ✓ | ✓ | ✓ |
| 10 | 22 | 20 | ✓ | ✓ | ✓ |
| 11 | 25 | 23 | ✓ | ✓ | ✓ |
| 13 | 15 | 13 | ✓ | ✓ | ✓ |
| 14 | 15 | 13 | ✓ | | ✓ |
| 15 | 22 | 19 | ✓ | | ✓ |
| 17 | 16 | 14 | ✓ | ✓ | ✓ |
| 18 | 25 | 23 | ✓ | ✓ | ✓ |
| 19 | 24 | 22 | ✓ | ✓ | ✓ |
| 21 | 12 | 10 | ✓ | ✓ | ✓ |
| 25 | 16 | 14 | ✓ | | ✓ |
| 26 | 19 | 17 | ✓ | ✓ | ✓ |
| 27 | 16 | 14 | ✓ | | ✓ |
| 28 | 27 | 25 | ✓ | | ✓ |
| 29 | 22 | 20 | ✓ | ✓ | ✓ |
| 30 | 22 | 20 | ✓ | ✓ | ✓ |
| 31 | 25 | 23 | ✓ | ✓ | ✓ |
| 32 | 19 | 17 | ✓ | ✓ | ✓ |
| 33 | 31 | 29 | ✓ | ✓ | ✓ |
| 34 | 21 | 20 | ✓ | ✓ | ✓ |
| 35 | 29 | 27 | ✓ | ✓ | ✓ |
| 36 | 19 | 18 | ✓ | ✓ | ✓ |
| 37 | 26 | 26 | ✓ | ✓ | ✓ |
| 38 | 21 | 20 | ✓ | ✓ | ✓ |
| 41A | 22 | 20 | ✓ | ✓ | ✓ |
| 41B | 19 | 18 | ✓ | | ✓ |
| 42 | 24 | 23 | ✓ | | ✓ |
| 44 | 30 | 37 | ✓ | | ✓ |
| 45 | 33 | 31 | ✓ | | ✓ |
| 47 | 25 | 23 | ✓ | ✓ | ✓ |
| 48 | 38 | 36 | ✓ | ✓ | ✓ |
| 49 | 40 | 38 | ✓ | ✓ | ✓ |
| 52 | 30 | 29 | ✓ | ✓ | ✓ |
| 57 | 22 | 21 | ✓ | ✓ | ✓ |
| 61 | 30 | 28 | ✓ | ✓ | ✓ |
| 62 | 31 | 30 | ✓ | ✓ | ✓ |
| 66 | 31 | 30 | ✓ | ✓ | ✓ |
| 67 | 34 | 33 | ✓ | ✓ | ✓ |
| 72 | 33 | 32 | ✓ | ✓ | ✓ |
| 73 | 17 | 15 | ✓ | ✓ | ✓ |
| 81 | 26 | 24 | ✓ | ✓ | ✓ |
| 82 | 31 | 29 | ✓ | ✓ | ✓ |
| 83 | 21 | 19 | ✓ | ✓ | ✓ |
| 84 | 34 | 32 | ✓ | ✓ | ✓ |
| 85 | 43 | 41 | ✓ | | ✓ |
| 88 | 44 | 44 | ✓ | ✓ | ✓ |
| 91 | 35 | 33 | ✓ | ✓ | ✓ |
| 92 | 32 | 30 | ✓ | ✓ | ✓ |
| 93 | 32 | 30 | ✓ | ✓ | ✓ |
| 94 | 31 | 29 | ✓ | ✓ | ✓ |

APPENDIX

Oceanographic Station Summary Sheets

All measurements are expressed in Meters,
Centigrade, and Knots unless otherwise
stated.

WEATHER CODE

| | | | |
|-----------------------------|---|----------|--------|
| 0/10 to 3/10 cloud coverage | = | Clear | (Clr) |
| 4/10 to 6/10 | = | Broken | (Bkn) |
| 7/10 to 9/10 | = | Cloudy | (Cldy) |
| 10/10 | = | Overcast | (Ovc) |

CLOUD TYPE

| | |
|----------------|--------|
| Stratus | (St) |
| Cirrus | (Ci) |
| Cumulus | (Cu) |
| Cirro-Cumulus | (CiCu) |
| Strato-Cumulus | (StCu) |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 16 Feb. 68 | TIME | 0430 G.M.T. |
|----------------|-------|------------|------------------|-----------|------------|----------------|-------------|
| OS NO | 1 | LATITUDE | 12 23.2'N | LONGITUDE | 100 03.3'E | CUR STA NO | 1 |
| DEPTH | 15 | WIND (E/N) | 150 | AIR TEMP | 24.5 | WEATHER | CLR |
| SEA SURF TEMP | 27.42 | DIR | 150 | WET | 24.5 | BAROMETER (25) | |
| WAVES | | SPEED | 9 to 17 | DRY | 29.4 | REMARKS | |
| DIRECTION (°T) | | SEA | | SWELL | | | |
| HEIGHT IN FEET | | | 140 | | | | |
| PERIOD IN SEC | | | 3 | | | | |
| DEPTH | | TEMP | | E.C. (‰) | SAL (‰) | CURRENT | |
| 0 | | 27.42 | | .0519 | 32.36 | DEPTH | DIR (°T) |
| 9 | | 27.18 | | .0517 | 32.37 | 3 | 130 |
| 13 | | 27.21 | | .0517 | 32.36 | 14 | 125 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 17 Feb. 68 | TIME | 0100 G.M.T. |
|----------------|-------|------------|------------------|-----------|------------|----------------|-------------|
| OS NO | 3 | LATITUDE | 12 23.4'N | LONGITUDE | 100 11.1'E | CUR STA NO | 3 |
| DEPTH | 26 | WIND (E/N) | 180 | AIR TEMP | 25.0 | WEATHER | CLR |
| SEA SURF TEMP | 27.24 | DIR | 180 | WET | 25.0 | BAROMETER (25) | |
| WAVES | | SPEED | 4 to 8 | DRY | 29.4 | REMARKS | |
| DIRECTION (°T) | | SEA | | SWELL | | | |
| HEIGHT IN FEET | | | 170 | | | | |
| PERIOD IN SEC | | | 3 | | | | |
| DEPTH | | TEMP | | E.C. (‰) | SAL (‰) | CURRENT | |
| 0 | | 27.24 | | .0515 | 32.25 | DEPTH | DIR (°T) |
| 12 | | 27.25 | | .0515 | 32.24 | 3 | 130 |
| 24 | | 27.27 | | .0516 | 32.27 | 13 | 150 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 16 Feb. 68 | TIME | 0725 G.M.T. |
|----------------|-------|------------|------------------|-----------|------------|----------------|-------------|
| OS NO | 2 | LATITUDE | 12 23.4'N | LONGITUDE | 100 06.2'E | CUR STA NO | 2 |
| DEPTH | 19 | WIND (E/N) | 140 | AIR TEMP | 25.0 | WEATHER | CLR |
| SEA SURF TEMP | 27.43 | DIR | 140 | WET | 25.0 | BAROMETER (25) | |
| WAVES | | SPEED | 7 to 14 | DRY | 29.4 | REMARKS | |
| DIRECTION (°T) | | SEA | | SWELL | | | |
| HEIGHT IN FEET | | | 140 | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (‰) | SAL (‰) | CURRENT | |
| 0 | | 27.43 | | .0517 | 32.25 | DEPTH | DIR (°T) |
| 8 | | 27.24 | | .0515 | 32.25 | 3 | 300 to 050 |
| 17 | | 27.18 | | .0515 | 32.25 | 10 | 295 to 050 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 17 Feb. 68 | TIME | 0525 G.M.T. |
|----------------|-------|------------|------------------|-----------|------------|----------------|-------------|
| OS NO | 4 | LATITUDE | 12 24.0'N | LONGITUDE | 100 16.0'E | CUR STA NO | 4 |
| DEPTH | 32 | WIND (E/N) | 190 | AIR TEMP | 25.0 | WEATHER | CLR |
| SEA SURF TEMP | 27.50 | DIR | 190 | WET | 25.0 | BAROMETER (25) | |
| WAVES | | SPEED | 1 to 4 | DRY | 29.4 | REMARKS | |
| DIRECTION (°T) | | SEA | | SWELL | | | |
| HEIGHT IN FEET | | | 160 | | | | |
| PERIOD IN SEC | | | 2 | | | | |
| DEPTH | | TEMP | | E.C. (‰) | SAL (‰) | CURRENT | |
| 0 | | 27.50 | | .0518 | 32.25 | DEPTH | DIR (°T) |
| 12 | | 27.25 | | .0515 | 32.25 | 11 | 160 |
| 30 | | 27.28 | | .0516 | 32.24 | 16 | 180 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 19 Feb. 68 | TIME | 0225 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 5 | LATITUDE | 12 28.4'N | LONGITUDE | 100 02.3'E | DEPTH | 15 |
| SEA SURF TEMP | 27.20 | WIND (KMPH) | 150 | AIR TEMP WET | 23.9 | CUR STA NO | 5 |
| | | DIR | 140 | WET | 26.7 | WEATHER | CLr |
| | | SPEED | 140 | DRY | 26.7 | BAROMETER (25.2) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (P/100) | CURRENT | |
| 0 | | 27.20 | | .0516 | 32.29 | DEPTH | DIR (FT) |
| 6 | | 27.25 | | .0516 | 32.29 | | 150 |
| 13 | | 27.26 | | .0517 | 32.29 | | 175 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 20 Feb. 68 | TIME | 0305 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 7 | LATITUDE | 12 29.0'N | LONGITUDE | 100 11.7'E | DEPTH | 28 |
| SEA SURF TEMP | 27.31 | WIND (KMPH) | 150 | AIR TEMP WET | 25.5 | CUR STA NO | 7 |
| | | DIR | 150 | WET | 27.2 | WEATHER | CLdy |
| | | SPEED | 2405 | DRY | 27.2 | BAROMETER (25.2) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (P/100) | CURRENT | |
| 0 | | 27.31 | | .0516 | 32.24 | DEPTH | DIR (FT) |
| 13 | | 27.28 | | .0516 | 32.23 | | 185 |
| 26 | | 27.32 | | .0516 | 32.26 | | 175 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 19 Feb. 68 | TIME | 0730 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 6 | LATITUDE | 12 28.7'N | LONGITUDE | 100 06.6'E | DEPTH | 21 |
| SEA SURF TEMP | 27.51 | WIND (KMPH) | 140 | AIR TEMP WET | 25.6 | CUR STA NO | 6 |
| | | DIR | 140 | WET | 30.0 | WEATHER | CLr |
| | | SPEED | 6408 | DRY | 30.0 | BAROMETER (25.2) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (P/100) | CURRENT | |
| 0 | | 27.51 | | .0518 | 32.23 | DEPTH | DIR (FT) |
| 9 | | 27.20 | | .0515 | 32.22 | | 240 |
| 19 | | 27.20 | | .0515 | 32.23 | | 045 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 6 Feb. 68 | TIME | 0730 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 9 | LATITUDE | 12 32.7'N | LONGITUDE | 100 01.4'E | DEPTH | 15 |
| SEA SURF TEMP | 27.59 | WIND (KMPH) | 090 | AIR TEMP WET | 25.0 | CUR STA NO | 9 |
| | | DIR | 104 | WET | 29.4 | WEATHER | CLr |
| | | SPEED | 104012 | DRY | 29.4 | BAROMETER (25.2) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (P/100) | CURRENT | |
| 0 | | 27.59 | | .0516 | 32.02 | DEPTH | DIR (FT) |
| 6 | | 27.19 | | .0512 | 32.03 | | See remarks |
| 13 | | 27.10 | | .0511 | 32.01 | | |

Current speeds less than 2 kt. Directions are unmeasurable.

| | | | | | | | | | |
|----------------|-------------|--------------|-----------|------------|---------|-----------|-------------|--------|--------|
| VESSEL | HTMS | AREA | GULF of | | DATE | 7 Feb. 68 | TIME | 0705 | G.M.T. |
| | BANGKRACHAN | | THAILAND | | | | | | |
| OS NO | 10 | LATITUDE | 12 32.7'N | 100 05.0'E | DEPTH | 22 | CUR STAG NO | 10 | 38 |
| SEA SURF TEMP | 27.62 | WIND (Kts) | 065 | AIR TEMP | 24.5 | WET | 24.5 | CLOUDS | 3/10 |
| | | DIR | 101 | DRY | 28.3 | | | COVER | 01 |
| WAVES | | SEA | | SWELL | | | | | |
| DIRECTION (°T) | 190 | | | | | | | | |
| HEIGHT IN FEET | 2 | | | | | | | | |
| PERIOD IN SEC | | | | | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | | CURRENT | | | | |
| 0 | 27.62 | .0516 | 32.05 | | DEPTH | SPEEDKTS | DIR (°T) | | |
| 6 | 27.15 | .0512 | 32.04 | | 14 | .3 | 160 | | |
| 12 | 27.10 | .0511 | 32.06 | | 20 | .3 | 145 | | |
| 20 | 27.08 | .0512 | 32.09 | | | .3 | 125 | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | | | | | | | | |
|----------------|-------|----------------------------------|------------------|----------------------------------|--|----------------|-----------------------|-----------------------------|--------|
| VESSEL | HTMS | AREA | GULF of THAILAND | | DATE | 9 Feb. 68 | TIME | 0115 | G.M.T. |
| OS NO | 13 | LATITUDE 12 37.7'N | | LONGITUDE 100 01.2'E | DEPTH 15 | CUR STA NO | 13 | BT ELIG NO 39 | |
| SEA SURF TEMP | 27.09 | WIND (KTS) DIR 210 SPEED 5 | | AIR TEMP WET 23.3 DRY 25.6 | BAGGEE (1230) | | WEATHER Clr | CLOUDS COVER 0 TYPE 0 | |
| WAVES | SEA | | SWELL | | REMARKS | | | | |
| DIRECTION (°T) | 120 | | | | Two distinct current directions at 4m. | | | | |
| HEIGHT IN FEET | 2 | | | | | | | | |
| PERIOD IN SEC | | | | | | | | | |
| DEPTH | TEMP | E.C. (g/cm) | SAL (‰) | | CURRENT | | | | |
| 0 | 27.09 | .0510 | 31.99 | | DEPTH 4 | SPEEDKTS .2 | DIR (°T) 180 & 045 | | |
| 6 | 27.13 | .0511 | 32.02 | | 12 | K.2 | - | | |
| 13 | 27.16 | .0511 | 32.00 | | | | | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | 7 Feb. 68 | TIME | 0405 | G.M.T. | | | |
| | BANGRACHAN | | THAILAND | | | | | | | | |
| OS NO | 11 | LATITUDE | 12 32.7'N | LONGITUDE | 100 09.3'E | DEPTH | 25 | CUR STA NO | 11 | 37 | BY ALICE MO |
| SEA SURF TEMP | 27.43 | WIND (KTS) | 145 | AIR TEMP | 25.0 | WET | 25.0 | CLOUDS | 1/10 | | |
| | | DIR | 2 | DRY | 30.0 | | | COVER | 01 | | |
| WAVES | | SEA | | SWELL | | | | TYPE | 01 | | |
| DIRECTION (°T) | 120 | | | | | | | CLAR | | | |
| HEIGHT IN FEET | 2 | | | | | | | | | | |
| PERIOD IN SEC | | | | | | | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | SPEED(KTS) | DIR (°T) | | | | | |
| 0 | 27.43 | .0515 | 32.07 | 4 | .7 | 125 | | | | | |
| 10 | 27.09 | .0511 | 32.06 | 13 | .6 | 150 | | | | | |
| 23 | 27.09 | .0511 | 32.06 | 23 | .5 | 170 | | | | | |
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| VESSEL | HTMS | AREA | Gulf of | DATE | 21 Feb. 68 | TIME | 0215 | G.M.T. | |
| | BANGRACHAN | | THAILAND | | | | | | |
| OS NO | 14 | 12 37.5'N | 100 05.2'E | DEPTH | 15 | CUR STA NO | | 57 | |
| SEA SURF TEMP | 27.14 | WIND (Kts) | 050 | AIR TEMP | 23.3 | WET | 23.3 | CLOUDS | 6/10 |
| | | DIR | 3 | DRY | 26.1 | | | COVER | 01 |
| WAVES | | SEA | | SWELL | | | | | |
| DIRECTION (°T) | | | | 140 | | | | | |
| HEIGHT IN FEET | | | | 5 | | | | | |
| PERIOD IN SEC | | | | 6 | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | SPEED(KTS) | DIR (°T) | | | |
| 0 | 27.14 | .0512 | 32.12 | - | - | - | | | |
| 13 | 27.10 | .0512 | 32.11 | | | | | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|-------------|------------------|-------------|
| | BANGRACHAN | THAILAND | | 21 Feb. 68 | 0655 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | CUR STA NO | DEPTH | BT SLICE NO |
| 15 | 12 37.3'N | 100 09.9'E | 22 | | 58 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | BAROMETER (25.5) | WEATHER |
| 27.41 | 090 | 23.9 | | | CLdy |
| WAVES | SEA | SWELL | REMARKS | | |
| DIRECTION (FT) | 080 | | | | |
| HEIGHT IN FEET | 5 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | 27.41 | .0514 | 32.05 | | DIR (FT) |
| 19 | 27.17 | .0513 | 32.10 | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|-------------|------------------|-------------|
| | BANGRACHAN | THAILAND | | 9 Feb. 68 | 0430 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | CUR STA NO | DEPTH | BT SLICE NO |
| 17 | 12 41.2'N | 100 02.8'E | 16 | | 40 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | BAROMETER (25.5) | WEATHER |
| 27.69 | 140 | 25.0 | | | CLr |
| WAVES | SEA | SWELL | REMARKS | | |
| DIRECTION (FT) | 120 | | | | |
| HEIGHT IN FEET | 2 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | 27.69 | .0517 | 32.04 | | DIR (FT) |
| 6 | 27.29 | .0514 | 32.09 | | |
| 14 | 27.29 | .0514 | 32.07 | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|-------------|------------------|-------------|
| | BANGRACHAN | THAILAND | | 10 Feb. 68 | 0135 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | CUR STA NO | DEPTH | BT SLICE NO |
| 18 | 12 41.0'N | 100 07.8'E | 25 | | 42 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | BAROMETER (25.5) | WEATHER |
| 27.21 | 260 | 25.0 | | | CLr |
| WAVES | SEA | SWELL | REMARKS | | |
| DIRECTION (FT) | 120 | | | | |
| HEIGHT IN FEET | 3 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | 27.21 | .0512 | 32.06 | | DIR (FT) |
| 10 | 27.20 | .0512 | 32.05 | | |
| 23 | 27.21 | .0512 | 32.05 | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|-------------|------------------|-------------|
| | BANGRACHAN | THAILAND | | 10 Feb. 68 | 0510 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | CUR STA NO | DEPTH | BT SLICE NO |
| 19 | 12 40.4'N | 100 12.7'E | 24 | | 43 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | BAROMETER (25.5) | WEATHER |
| 27.50 | 110 | 25.0 | | | CLdy |
| WAVES | SEA | SWELL | REMARKS | | |
| DIRECTION (FT) | Calm | | | | |
| HEIGHT IN FEET | | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | 27.50 | .0516 | 32.10 | | DIR (FT) |
| 10 | 27.27 | .0514 | 32.10 | | |
| 22 | 27.29 | .0514 | 32.10 | | |
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| VESSEL HTMS BANGRACHAN | AREA GULF of THAILAND | DATE 9 Feb. 68 | TIME 0755 G.M.T. | |
| OS NO | LATITUDE | DEPTH | CUR STD NO | |
| 21 | 12 44.7'N 100 02.0'E | 12 | 21 | |
| SEA SURF TEMP 27.73 | WIND (KTS) DIR 140 SPEED 10 to 13 | AIR TEMP WET 26.1 DRY 30.0 | BAROMETER (IN HG) WEATHER CLR | |
| WAVES | SEA | SWELL | REMARKS | |
| DIRECTION (PT) | 110 | | Current vectors very erratic. | |
| HEIGHT IN FEET | 3 | | | |
| PERIOD IN SEC | | | | |
| DEPTH | TEMP | E.C. (dbar) | SAL (°/oo) | CURRENT |
| 0 | 27.73 | .0515 | 31.90 | DEPTH SPEEDKTS DIR (PT) |
| 5 | 27.56 | .0515 | 32.00 | 1 .2 270 |
| 10 | 27.35 | .0513 | 32.00 | 4 .2 185 |
| | | | | 10 .3 230 |
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| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 23 Jan. 68 | TIME | 0855 G.M.T. |
|----------------|-------|---------------|------------------|----------------|------------|----------------|-------------|
| OS NO | 32 | LATITUDE | 13 03.1'N | LONGITUDE | 100 50.6'E | CUR STA NO | 19 |
| SEA SURF TEMP | 27.07 | WIND (Knots) | 335 | WIND DIR | 335 | WIND SPEED | 8 to 11 |
| AIR TEMP | 27.07 | WET BULB | 25.9 | WET BULB DIR | 25.9 | WET BULB SPEED | 25.6 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | PERIOD IN SEC | | HEIGHT IN FEET | | PERIOD IN SEC | |
| DEPTH | TEMP | E.C. (m/sec) | SAL (‰) | DEPTH | CURRENT | DEPTH | DIR (°T) |
| 0 | 27.07 | .512 | 32.10 | 3 | <.2 | 175 | |
| 7 | 26.91 | .0510 | 32.10 | 10 | .3 | 190 | |
| 17 | 26.83 | .0509 | 32.09 | 18 | <.2 | - | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 23 Jan. 68 | TIME | 0430 G.M.T. |
|----------------|-------|---------------|------------------|----------------|------------|----------------|-------------|
| OS NO | 34 | LATITUDE | 13 01.8'N | LONGITUDE | 100 43.0'E | CUR STA NO | 34 |
| SEA SURF TEMP | 27.03 | WIND (Knots) | 180 | WIND DIR | 180 | WIND SPEED | 9 to 12 |
| AIR TEMP | 27.03 | WET BULB | 25.0 | WET BULB DIR | 25.0 | WET BULB SPEED | 28.4 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | PERIOD IN SEC | | HEIGHT IN FEET | | PERIOD IN SEC | |
| DEPTH | TEMP | E.C. (m/sec) | SAL (‰) | DEPTH | CURRENT | DEPTH | DIR (°T) |
| 0 | 27.03 | .0512 | 32.17 | 4 | .5 | 210 | |
| 10 | 26.95 | .0512 | 32.18 | 10 | .6 | 160 | |
| 20 | 26.96 | .0512 | 32.17 | 19 | .6 | 165 | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 20 Jan. 68 | TIME | 0420 G.M.T. |
|----------------|-------|---------------|------------------|----------------|------------|----------------|-------------|
| OS NO | 33 | LATITUDE | 13 02.6'E | LONGITUDE | 100 47.5'E | CUR STA NO | 33 |
| SEA SURF TEMP | 27.06 | WIND (Knots) | 070 | WIND DIR | 070 | WIND SPEED | 3 |
| AIR TEMP | 27.06 | WET BULB | 25.0 | WET BULB DIR | 25.0 | WET BULB SPEED | 29.4 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | PERIOD IN SEC | | HEIGHT IN FEET | | PERIOD IN SEC | |
| DEPTH | TEMP | E.C. (m/sec) | SAL (‰) | DEPTH | CURRENT | DEPTH | DIR (°T) |
| 0 | 27.06 | .0512 | 32.09 | 3 | .3 | 180 | |
| 7 | 26.87 | .0510 | 32.10 | 10 | .3 | 150 | |
| 14 | 26.88 | .0510 | 32.12 | 29 | .2 | 145 | |
| 29 | 26.89 | .0510 | 32.11 | | | | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 23 Jan. 68 | TIME | 0105 G.M.T. |
|----------------|-------|---------------|------------------|----------------|------------|----------------|-------------|
| OS NO | 35 | LATITUDE | 13 01.0'N | LONGITUDE | 100 38.5'E | CUR STA NO | 35 |
| SEA SURF TEMP | 26.94 | WIND (Knots) | 010 | WIND DIR | 010 | WIND SPEED | 6 to 8 |
| AIR TEMP | 26.94 | WET BULB | 24.14 | WET BULB DIR | 24.14 | WET BULB SPEED | 29.1 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | PERIOD IN SEC | | HEIGHT IN FEET | | PERIOD IN SEC | |
| DEPTH | TEMP | E.C. (m/sec) | SAL (‰) | DEPTH | CURRENT | DEPTH | DIR (°T) |
| 0 | 26.94 | .0511 | 32.16 | 3 | .3 | 350 | |
| 14 | 26.91 | .0511 | 32.16 | 14 | <.2 | Approx. 030 | |
| 27 | 26.89 | .0511 | 32.16 | 25 | .2 | 095 | |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|----------|-------------|-------------|
| | BANGRACHAN | | THAILAND | 20 Jan. 68 | 0710 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | DEPTH | CUR STA NO | BT SLIDE NO |
| 36 | 13 00.5'N | 100 50.9'E | 19 | 36 | 20 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | WET | WET |
| 27.32 | 320 | 25.6 | 30.5 | 30.5 | 30.5 |
| WAVES | SEA | SWELL | REMARKS | WIND | WIND |
| DIRECTION (FT) | - | - | - | CLr | CLr |
| HEIGHT IN FEET | | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | CURRENT |
| 0 | 27.32 | .0514 | 32.10 | See remarks | DIR (FT) |
| 8 | 26.83 | .0509 | 32.08 | | |
| 18 | 26.83 | - | - | | |
| | | | | | |
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| | | | | | |

Current velocities
too low to record.

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|----------|------------|-------------|
| | BANGRACHAN | | THAILAND | 4 Jan. 68 | 0435 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | DEPTH | CUR STA NO | BT SLIDE NO |
| 38 | 12 51.8'N | 100 48.5'E | 21 | 38 | 7 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | WET | WET |
| 26.55 | 015 | 19.5 | 25.6 | 25.6 | 25.6 |
| WAVES | SEA | SWELL | REMARKS | WIND | WIND |
| DIRECTION (FT) | - | - | - | CLr | CLr |
| HEIGHT IN FEET | | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | CURRENT |
| 0 | 26.55 | .0504 | 31.90 | 3 | DIR (FT) |
| 10 | 26.52 | .0503 | 31.90 | 11 | 100 |
| 20 | 26.50 | .0503 | 31.89 | 18 | 255 |
| | | | | | |
| | | | | | |
| | | | | | |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|----------|------------|-------------|
| | BANGRACHAN | | THAILAND | 22 Jan. 68 | 0450 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | DEPTH | CUR STA NO | BT SLIDE NO |
| 37 | 12 57.9'N | 100 37.9'E | 28 | 37 | 21 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | WET | WET |
| 27.08 | 160 | 25.0 | 27.8 | 27.8 | 27.8 |
| WAVES | SEA | SWELL | REMARKS | WIND | WIND |
| DIRECTION (FT) | 180 | - | - | CLr | CLr |
| HEIGHT IN FEET | 2 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | CURRENT |
| 0 | 27.08 | .0513 | 32.14 | 3 | DIR (FT) |
| 5 | 26.91 | .0511 | 32.14 | 12 | 200 |
| 10 | 26.88 | .0511 | 32.14 | 25 | 175 |
| 26 | 26.87 | .0510 | 32.12 | | 180 |
| | | | | | |
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| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|--------------|--------------|----------|------------|-------------|
| | BANGRACHAN | | THAILAND | 4 Jan. 68 | 0820 G.M.T. |
| OS NO | LATITUDE | LONGITUDE | DEPTH | CUR STA NO | BT SLIDE NO |
| 41A | 12 46.9'N | 100 49.4'E | 22 | 41A | 8 |
| SEA SURF TEMP | WIND (Knots) | AIR TEMP | WET | WET | WET |
| 26.77 | 330 | 21.1 | 27.8 | 27.8 | 27.8 |
| WAVES | SEA | SWELL | REMARKS | WIND | WIND |
| DIRECTION (FT) | 330 | - | - | CLr | CLr |
| HEIGHT IN FEET | 4 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (‰) | DEPTH | CURRENT |
| 0 | 26.77 | .0506 | 31.91 | 3 | DIR (FT) |
| 10 | 26.74 | .0505 | 31.91 | 12 | 235 |
| 20 | 26.76 | .0506 | 31.91 | - | 240 |
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|----------------|-------|--------------|------------------|--------------|----------------------|--------------------|-------|------------|
| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 19 Jan. 68 | TIME | 0200 | G.M.T. |
| OS NO | 41B | LATITUDE | 12 46.9'N | LONGITUDE | 100 49.4'E | DEPTH | 19 | CUR STA NO |
| SEA SURF TEMP | 26.91 | WIND (Knots) | 0 | AIR TEMP | WET 25.0 DRY 29.4 | BAROMETER (INCHES) | 25.0 | WEATHER |
| WAVES | | SEA | | SWELL | | REMARKS | | |
| DIRECTION (FT) | | | | | | | | |
| HEIGHT IN FEET | | | | | | | | |
| PERIOD IN SEC | | | | | | | | |
| DEPTH | 0 | TEMP | 26.91 | E.C. (mbars) | 0.511 | SAL (‰) | 32.16 | CURRENT |
| | 9 | | 26.86 | | 0.511 | | 32.16 | DEPTH |
| | 18 | | 26.87 | | 0.511 | | 32.17 | SPEEDKTS |
| | | | | | | | | DIR (°) |
| | | | | | | | | |
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|----------------|-------|--------------|------------------|--------------|----------------------|--------------------|------|------------|
| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 20 Dec. 67 | TIME | 0840 | G.M.T. |
| OS NO | 42 | LATITUDE | 12 46.2'N | LONGITUDE | 100 46.8'E | DEPTH | 24 | CUR STA NO |
| SEA SURF TEMP | 27.45 | WIND (Knots) | 270 | AIR TEMP | WET 22.8 DRY 27.2 | BAROMETER (INCHES) | 27.2 | WEATHER |
| WAVES | | SEA | | SWELL | | REMARKS | | |
| DIRECTION (FT) | | | | | | | | |
| HEIGHT IN FEET | | | | | | | | |
| PERIOD IN SEC | | | | | | | | |
| DEPTH | 0 | TEMP | 27.45 | E.C. (mbars) | | SAL (‰) | | CURRENT |
| | 12 | | 27.01 | | | | | DEPTH |
| | 23 | | 27.02 | | | | | SPEEDKTS |
| | | | | | | | | DIR (°) |
| | | | | | | | | |
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|----------------|-------|--------------|------------------|--------------|----------------------|--------------------|------|------------|
| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 23 Dec. 67 | TIME | 0330 | G.M.T. |
| OS NO | 44 | LATITUDE | 12 44.3'N | LONGITUDE | 100 38.4'E | DEPTH | 38 | CUR STA NO |
| SEA SURF TEMP | 27.21 | WIND (Knots) | 286 | AIR TEMP | WET 22.2 DRY 27.2 | BAROMETER (INCHES) | 22.2 | WEATHER |
| WAVES | | SEA | | SWELL | | REMARKS | | |
| DIRECTION (FT) | | | | | | | | |
| HEIGHT IN FEET | | | | | | | | |
| PERIOD IN SEC | | | | | | | | |
| DEPTH | 0 | TEMP | 27.21 | E.C. (mbars) | | SAL (‰) | | CURRENT |
| | 10 | | 27.07 | | | | | DEPTH |
| | 23 | | 27.10 | | | | | SPEEDKTS |
| | 37 | | 27.09 | | | | | DIR (°) |
| | | | | | | | | |
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|----------------|-------|--------------|------------------|--------------|----------------------|--------------------|------|------------|
| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 22 Dec. 67 | TIME | 0400 | G.M.T. |
| OS NO | 45 | LATITUDE | 12 36.7'N | LONGITUDE | 100 36.9'E | DEPTH | 33 | CUR STA NO |
| SEA SURF TEMP | 27.14 | WIND (Knots) | 317 | AIR TEMP | WET 22.8 DRY 27.8 | BAROMETER (INCHES) | 22.8 | WEATHER |
| WAVES | | SEA | | SWELL | | REMARKS | | |
| DIRECTION (FT) | | | | | | | | |
| HEIGHT IN FEET | | | | | | | | |
| PERIOD IN SEC | | | | | | | | |
| DEPTH | 0 | TEMP | 27.14 | E.C. (mbars) | | SAL (‰) | | CURRENT |
| | 10 | | 27.10 | | | | | DEPTH |
| | 20 | | 27.03 | | | | | SPEEDKTS |
| | 31 | | 27.03 | | | | | DIR (°) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 13 Feb. 68 | TIME | 0540 G.M.T. |
|----------------|-------|--------------|------------------|-----------|------------|------------------|-------------|
| OS NO | 47 | LATITUDE | 12 35.5'N | LONGITUDE | 100 53.5'E | DEPTH | 25 |
| CUR STA NO | 47 | ST SLIDE NO | 45 | WEATHER | OVC | CLOUDS COVER | 10/10 |
| SEA SURF TEMP | 27.49 | WIND (E/10) | 095 | AIR TEMP | 22.8 | BAROMETER (H/25) | 27.2 |
| WET | 5 | DIR | 5 | WET | 27.2 | DRY | 27.2 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | 120 | | | |
| HEIGHT IN FEET | | | | 3 | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (P/00) | DEPTH | SPEED(KTS) | DIR (FT) | |
| 0 | 27.49 | .0518 | 32.21 | 4 | .8 | 105 | |
| 9 | 27.38 | .0516 | 32.20 | 13 | .6 | 100 | |
| 23 | 27.35 | .0517 | 32.22 | 23 | .4 | 110 | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 3 Feb. 68 | TIME | 0855 G.M.T. |
|----------------|-------|--------------|------------------|-----------|------------|------------------|-------------|
| OS NO | 49 | LATITUDE | 12 29.8'N | LONGITUDE | 100 51.0'E | DEPTH | 40 |
| CUR STA NO | 49 | ST SLIDE NO | 35 | WEATHER | Bkn | CLOUDS COVER | 5/10 |
| SEA SURF TEMP | 27.63 | WIND (E/10) | 140 | AIR TEMP | 25.6 | BAROMETER (H/25) | 28.9 |
| WET | 7 | DIR | 7 | WET | 28.9 | DRY | 28.9 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | 140 | | | |
| HEIGHT IN FEET | | | | 3 | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (P/00) | DEPTH | SPEED(KTS) | DIR (FT) | |
| 0 | 27.63 | .0519 | 32.24 | 4 | .4 | 305 | |
| 10 | 27.30 | .0516 | 32.22 | 20 | .3 | 300 | |
| 24 | 27.29 | .0516 | 32.23 | 38 | .3 | 311 & 047 | |
| 38 | 27.30 | .0516 | 32.23 | | | | |

Two distinct directions for the current at 38m.

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 13 Feb. 68 | TIME | 0235 G.M.T. |
|----------------|-------|--------------|------------------|-----------|------------|------------------|-------------|
| OS NO | 48 | LATITUDE | 12 32.5'N | LONGITUDE | 100 52.5'E | DEPTH | 38 |
| CUR STA NO | 48 | ST SLIDE NO | 44 | WEATHER | Cldy | CLOUDS COVER | 9/10 |
| SEA SURF TEMP | 27.46 | WIND (E/10) | 345 | AIR TEMP | 22.2 | BAROMETER (H/25) | 26.7 |
| WET | 7.09 | DIR | 7.09 | WET | 26.7 | DRY | 26.7 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | 120 | | | |
| HEIGHT IN FEET | | | | 4 | | | |
| PERIOD IN SEC | | | | 5 | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (P/00) | DEPTH | SPEED(KTS) | DIR (FT) | |
| 0 | 27.46 | .0518 | 32.26 | 3 | .3 | 145 | |
| 10 | 27.49 | .0518 | 32.23 | 19 | .5 | 105 | |
| 36 | 27.52 | .0518 | 32.22 | 35 | .4 | 080 | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 6 Jan. 68 | TIME | 0410 G.M.T. |
|----------------|-------|--------------|------------------|-----------|------------|------------------|-------------|
| OS NO | 52 | LATITUDE | 12 24.7'N | LONGITUDE | 101 04.7'E | DEPTH | 30 |
| CUR STA NO | 52 | ST SLIDE NO | 9 | WEATHER | Clr | CLOUDS COVER | 0 |
| SEA SURF TEMP | 26.58 | WIND (E/10) | 315 | AIR TEMP | 20.6 | BAROMETER (H/25) | 26.1 |
| WET | 5 | DIR | 5 | WET | 26.1 | DRY | 26.1 |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (FT) | | | | 315 | | | |
| HEIGHT IN FEET | | | | 2 | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (P/00) | DEPTH | SPEED(KTS) | DIR (FT) | |
| 0 | 26.58 | .0504 | 31.91 | 3 | <.2 | - | |
| 9 | 26.54 | .0503 | 31.91 | 15 | <.2 | 085 | |
| 19 | 26.55 | .0504 | 31.91 | 28 | <.2 | - | |
| 29 | 26.53 | .0503 | 31.90 | | | | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 16 Jan 68 | TIME | 0350 G.M.T. |
|----------------|-------|------------|------------------|------------|------------|------------------|-------------|
| OS NO | 57 | LATITUDE | 12 27.7'N | LONGITUDE | 101 07.3'E | CUR STA NO | 57 |
| SEA SURF TEMP | 26.54 | WIND DIR | 340 | AIR TEMP | 20.0 | WEATHER | CLR |
| | | WIND SPEED | 4 | WET DRY | 25.0 | BAROMETER (25.5) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (PT) | | | | 000 | | | |
| HEIGHT IN FEET | | | | 3 | | | |
| PERIOD IN SEC | | | | 3 | | | |
| DEPTH | | TEMP | E.C. (mbars) | SAL (°/00) | CURRENT | DEPTH | DIR (°) |
| 0 | | 26.54 | .0505 | 32.02 | | 3 | 150 |
| 11 | | 26.54 | .0505 | 32.01 | | 10 | 112 |
| 21 | | 26.56 | .0506 | 32.04 | | 20 | 103 |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 16 Jan. 68 | TIME | 0815 G.M.T. |
|----------------|-------|------------|------------------|------------|------------|------------------|-------------|
| OS NO | 61 | LATITUDE | 12 25.5'N | LONGITUDE | 101 14.8'E | CUR STA NO | 61 |
| SEA SURF TEMP | 26.75 | WIND DIR | 230 | AIR TEMP | 22.2 | WEATHER | CLR |
| | | WIND SPEED | 6 | WET DRY | 28.9 | BAROMETER (25.5) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (PT) | | | | 220 | | | |
| HEIGHT IN FEET | | | | 1 | | | |
| PERIOD IN SEC | | | | 1 | | | |
| DEPTH | | TEMP | E.C. (mbars) | SAL (°/00) | CURRENT | DEPTH | DIR (°) |
| 0 | | 26.75 | .0512 | 32.34 | | 3 | 145 |
| 7 | | 26.72 | .0510 | 32.24 | | 8 | 113 |
| 28 | | 26.66 | .0510 | 32.25 | | 22 | - |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 16 Jan. 68 | TIME | 0700 G.M.T. |
|----------------|-------|------------|------------------|------------|------------|------------------|-------------|
| OS NO | 62 | LATITUDE | 12 21.2'N | LONGITUDE | 101 12.3'E | CUR STA NO | 62 |
| SEA SURF TEMP | 26.85 | WIND DIR | 060 | AIR TEMP | 21.7 | WEATHER | CLR |
| | | WIND SPEED | 5 | WET DRY | 27.8 | BAROMETER (25.5) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (PT) | | | | - | | | |
| HEIGHT IN FEET | | | | - | | | |
| PERIOD IN SEC | | | | - | | | |
| DEPTH | | TEMP | E.C. (mbars) | SAL (°/00) | CURRENT | DEPTH | DIR (°) |
| 0 | | 26.85 | .0514 | 32.35 | | 3 | - |
| 10 | | 26.77 | .0512 | 32.34 | | 10 | 150 |
| 20 | | 26.76 | .0513 | 32.36 | | 28 | - |
| 30 | | 26.75 | .0512 | 32.34 | | | |

| VESSEL | HTMS | AREA | GULF of THAILAND | DATE | 17 Jan 68 | TIME | 0130 G.M.T. |
|----------------|-------|------------|------------------|------------|------------|------------------|-------------|
| OS NO | 66 | LATITUDE | 12 22.6'N | LONGITUDE | 101 31.3'E | CUR STA NO | 66 |
| SEA SURF TEMP | 26.66 | WIND DIR | 040 | AIR TEMP | 21.7 | WEATHER | CLR |
| | | WIND SPEED | 6 | WET DRY | 25.6 | BAROMETER (25.5) | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (PT) | | | | 040 | | | |
| HEIGHT IN FEET | | | | 3 | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | E.C. (mbars) | SAL (°/00) | CURRENT | DEPTH | DIR (°) |
| 0 | | 26.66 | .0512 | 32.37 | | 3 | 305 |
| 15 | | 26.65 | .0511 | 32.36 | | 15 | 195 |
| 30 | | 26.67 | .0512 | 32.36 | | 28 | 310 |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|------------|----------------|---------------|-------------|---------------------------|
| | BANGRACHAN | THAILAND | | 20 Jan. 68 | 0100 G.M.T. |
| OS NO | 82 | 12 59.8'N | 100 46.5'E | DEPTH 31 | CUR STA NO 82 |
| SEA SURF TEMP | 26.81 | WIND (KPH) 015 | AIR TEMP 25.0 | WEATHER Bkn | CLOUDS 5/10 |
| | | DIR SPEED 2 | WET DRY 28.3 | | COVER TYPE Cu |
| WAVES | | SEA | SWELL | REMARKS | |
| DIRECTION (°T) | 130 | | | | |
| HEIGHT IN FEET | 1 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | DEPTH | CURRENT SPEEDKTS DIR (°T) |
| 0 | 26.81 | .0509 | 32.10 | 3 | .4 015 |
| 9 | 26.83 | .0509 | 32.10 | 15 | .3 025 |
| 18 | 26.80 | .0509 | 32.10 | 27 | .3 015 |
| 29 | 26.79 | .0509 | 32.10 | | |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|------------|------------------|---------------|-------------|---------------------------|
| | BANGRACHAN | THAILAND | | 19 Jan 68 | 0530 G.M.T. |
| OS NO | 84 | 12 55.3'N | 100 43.4'E | DEPTH 34 | CUR STA NO 84 |
| SEA SURF TEMP | 27.39 | WIND (KPH) 035 | AIR TEMP 24.5 | WEATHER Clr | CLOUDS 1/10 |
| | | DIR SPEED 2 to 4 | WET DRY 27.8 | | COVER TYPE Cu |
| WAVES | | SEA | SWELL | REMARKS | |
| DIRECTION (°T) | 025 | | | | |
| HEIGHT IN FEET | 1 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | DEPTH | CURRENT SPEEDKTS DIR (°T) |
| 0 | 27.39 | .0516 | 32.20 | 3 | - - |
| 11 | 26.97 | .0512 | 32.19 | 13 | <.2 150 |
| 22 | 26.96 | .0512 | 32.19 | | |
| 32 | 26.94 | .0511 | 32.20 | | |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|------------|------------------|---------------|-------------|---------------------------|
| | BANGRACHAN | THAILAND | | 22 Jan. 68 | 0830 G.M.T. |
| OS NO | 83 | 12 59.0'N | 100 42.9'E | DEPTH 21 | CUR STA NO 83 |
| SEA SURF TEMP | 27.45 | WIND (KPH) 330 | AIR TEMP 25.0 | WEATHER Clr | CLOUDS 1/10 |
| | | DIR SPEED 7 to 9 | WET DRY 29.4 | | COVER TYPE Cu |
| WAVES | | SEA | SWELL | REMARKS | |
| DIRECTION (°T) | 180 | | | | |
| HEIGHT IN FEET | 3 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | DEPTH | CURRENT SPEEDKTS DIR (°T) |
| 0 | 27.45 | .0516 | 32.17 | | See Remarks |
| 9 | 26.95 | .0512 | 32.17 | | |
| 19 | 26.94 | .0511 | 32.18 | | |

| VESSEL | HTMS | AREA | GULF of | DATE | TIME |
|----------------|------------|-------------------|---------------|-------------|---------------------------|
| | BANGRACHAN | THAILAND | | 3 Jan. 68 | 0325 G.M.T. |
| OS NO | 85 | 12 41.0'N | 100 41.9'E | DEPTH 43 | CUR STA NO 85 |
| SEA SURF TEMP | 27.05 | WIND (KPH) 000 | AIR TEMP 20.0 | WEATHER Clr | CLOUDS 1/10 |
| | | DIR SPEED 8 to 11 | WET DRY 27.2 | | COVER TYPE Ci |
| WAVES | | SEA | SWELL | REMARKS | |
| DIRECTION (°T) | 000 | | | | |
| HEIGHT IN FEET | 3 | | | | |
| PERIOD IN SEC | | | | | |
| DEPTH | TEMP | E.C. (mbars) | SAL (°/100) | DEPTH | CURRENT SPEEDKTS DIR (°T) |
| 0 | 27.05 | .0510 | 32.03 | | |
| 13 | 27.05 | .0510 | 32.03 | | |
| 26 | 27.01 | .0510 | 32.03 | | |
| 41 | 27.00 | .0510 | 32.03 | | |

| VEHICLE | HTMS | AREA | GULF of THAILAND | DATE | 22 Dec. 67 | TIME | 0730 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 88 | LATITUDE | 12 36.9'N | LONGITUDE | 100 41.4'E | DEPTH | 46 |
| | | CUR STAN NO | 88 | | | | |
| SEA SURF TEMP | 27.52 | WIND (Kts) | 275 | AIR TEMP | 23.9 | WEATHER | Clr |
| | | DIR | 5 to 7 | WET | 30.6 | BAROMETER (25.5) | |
| | | SPEED | | DRY | | | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (°T) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | | 27.52 | | - | - | DEPTH | DIR (°T) |
| 14 | | 27.09 | | - | - | 2 | < .2 |
| 29 | | 27.03 | | - | - | 30 | < .2 |
| 44 | | 27.07 | | - | - | 44 | .2 |
| | | | | | | | 015 |
| | | | | | | | |
| | | | | | | | |

| VEHICLE | HTMS | AREA | GULF of THAILAND | DATE | 14 Feb. 68 | TIME | 0725 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 92 | LATITUDE | 12 31.0'N | LONGITUDE | 100 44.4'E | DEPTH | 32 |
| | | CUR STAN NO | 92 | | | | |
| SEA SURF TEMP | 27.54 | WIND (Kts) | 160 | AIR TEMP | 25.0 | WEATHER | Bkn |
| | | DIR | 6 to 8 | WET | 30.6 | BAROMETER (25.5) | |
| | | SPEED | | DRY | | | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (°T) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | | 27.54 | | .0517 | 32.20 | DEPTH | DIR (°T) |
| 10 | | 27.34 | | .0515 | 32.20 | 4 | - |
| 30 | | 27.35 | | .0516 | 32.19 | 18 | .4 |
| | | | | | | 30 | .3 |
| | | | | | | | 285 |
| | | | | | | | 085 |
| | | | | | | | |
| | | | | | | | |

| VEHICLE | HTMS | AREA | GULF of THAILAND | DATE | 3 Feb. 68 | TIME | 0545 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 91 | LATITUDE | 12 27.8'N | LONGITUDE | 100 54.0'E | DEPTH | 35 |
| | | CUR STAN NO | 91 | | | | |
| SEA SURF TEMP | 27.32 | WIND (Kts) | 140 | AIR TEMP | 25.0 | WEATHER | Clr |
| | | DIR | 11 | WET | 29.4 | BAROMETER (25.5) | |
| | | SPEED | | DRY | | | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (°T) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | | 27.32 | | .0516 | 32.26 | DEPTH | DIR (°T) |
| 8 | | 27.32 | | .0516 | 32.26 | 4 | .5 |
| 20 | | 27.36 | | .0517 | 32.27 | 19 | .5 |
| 33 | | 27.03 | | .0513 | 32.27 | 33 | .4 |
| | | | | | | | 115 |
| | | | | | | | |
| | | | | | | | |

| VEHICLE | HTMS | AREA | GULF of THAILAND | DATE | 15 Feb. 68 | TIME | 0400 G.M.T. |
|----------------|-------|-------------|------------------|--------------|-------------|------------------|-------------|
| OS NO | 93 | LATITUDE | 12 25.5'N | LONGITUDE | 100 41.3'E | DEPTH | 32 |
| | | CUR STAN NO | 93 | | | | |
| SEA SURF TEMP | 27.27 | WIND (Kts) | 140 | AIR TEMP | 24.4 | WEATHER | Ovc |
| | | DIR | 8 to 10 | WET | 27.8 | BAROMETER (25.5) | |
| | | SPEED | | DRY | | | |
| WAVES | | SEA | | SWELL | | REMARKS | |
| DIRECTION (°T) | | | | | | | |
| HEIGHT IN FEET | | | | | | | |
| PERIOD IN SEC | | | | | | | |
| DEPTH | | TEMP | | E.C. (mbars) | SAL (°/100) | CURRENT | |
| 0 | | 27.27 | | .0515 | 32.19 | DEPTH | DIR (°T) |
| 15 | | 27.26 | | .0515 | 32.19 | 4 | .3 |
| 30 | | 27.31 | | .0515 | 32.18 | 15 | .5 |
| | | | | | | 30 | .3 |
| | | | | | | | 130 |
| | | | | | | | 105 |
| | | | | | | | 180 |
| | | | | | | | |
| | | | | | | | |

| | | | | | | | | | |
|----------------|-------|-----------------------|---------|-----------------------------|------|--|----|------------------------|-----------|
| VESSEL | | HTMS BANGRACHAN | | AREA GULF of THAILAND | | DATE 15 Feb. 68 | | TIME 0740 G.M.T. | |
| OS NO | 94 | LATITUDE 12 22.2'N | | LONGITUDE 100 38.0'E | | DEPTH | 31 | CUR STA NO | 94 |
| ST SLICE NO | | | | | | | | | 48 |
| SEA SURF TEMP | 27.50 | WIND TEMP | 150 | AIR TEMP | 24.4 | BAROMETER (22) | | WEATHER | Clr |
| | | DIR | 8 to 10 | WET | 30.0 | DRY | | CLOUDS | 1/10 |
| | | SPEED | | | | | | COVER | |
| | | | | | | | | TYPE | Cu |
| WAVES | | SEA | | SWELL | | REMARKS | | | |
| DIRECTION (FT) | | 110 | | | | Two distinct current directions at 16m. | | | |
| HEIGHT IN FEET | | 4 | | | | | | | |
| PERIOD IN SEC | | | | | | | | | |
| DEPTH | | TEMP | | E.C. (‰) | | SAL (‰) | | CURRENT | |
| 0 | 27.50 | .0518 | 32.27 | | | 3 | | SPEED (KTS) | DIR (PT) |
| 10 | 27.41 | .0518 | 32.28 | | | 16 | | .5 | 290 |
| 29 | 27.42 | .0517 | 32.27 | | | 29 | | .4 | 070 & 270 |
| | | | | | | | | .4 | 070 |
| | | | | | | | | | |
| | | | | | | | | | |
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| <p>The U.S. Naval Oceanographic Office and the Royal Thai Navy conducted a joint environmental survey in the Gulf of Thailand from 20 December 1967 to 21 February 1968. Operations included serial-depth temperature and salinity measurements at 57 station locations and current meter observations at 47 of the stations.</p> <p>The area surveyed in the Gulf of Thailand was found to be nearly isothermal and isohaline throughout the water column which attests to a well-developed mixing environment. The tidal currents in the gulf are thought to be responsible for the homogenous nature of the water. Characteristic of the region surveyed was the variance in current direction with depth for any one station location and the change in current vectors over short durations. Measured current speeds ranged to a maximum of 0.8 knot.</p> | | | |

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14.

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GULF OF THAILAND
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